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(54) Title: SEALANTS

(57) Abstract

A fire retarding sealant comprises a silicone resin, a filler, a ceramic fire retardant such as zinc borate, a smoke suppressant such as stearate coated calcium hydroxide, and either aluminium hydroxide or magnesium hydroxide, preferably the former. The sealant is intumescent, and non-setting, and is intended for placement around pipes, cables and service penetrations in walls, floors and ceilings. At the temperatures encountered in fires, the aluminium hydroxide decomposes to form aluminium oxide and steam, the latter causing the sealant to intumesce while being relatively harmless to people (no halogen gases are evolved). The aluminium oxide and zinc borate form a crust on the intumesced sealant, providing a further fire retardant property.

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TITLE

Sealants

DESCRIPTION

The invention relates to a sealant which is silicone based and has non-setting and fire-retarding and intumescing properties.

It is known that fire retarding sealants may be placed around pipes, cables and service penetrations in walls, floors and ceilings. However, such sealants may prevent access for servicing purposes.

The invention provides a sealant comprising a silicone resin, a filler, a ceramic fire retardant, a smoke suppressant, and either aluminium hydroxide or magnesium hydroxide.

The sealant according to the invention has intumescent properties derived from the aluminium or magnesium hydroxide. Its fire retarding properties are enhanced by the inclusion of the ceramic fire retardant, which is preferably zinc borate. The preferred hydroxide is aluminium hydroxide. At a temperature of about 200°C, this compound decomposes to form aluminium oxide and steam, the latter causing the sealant to intumesce while being relatively harmless to people. The aluminium oxide and zinc borate form a crust on the intumesced sealant providing a further fire retardant property. At the temperatures encountered in fires, the magnesium hydroxide behaves in a corresponding manner.

The sealant according to the invention, being placed in the service penetration, will thus intumesce upon exposure to heat in a fire, effectively sealing any spaces in the penetration which would allow fire and smoke to pass into another contained area. Since the

sealant is non-setting, however, it can be removed after installation for servicing purposes. Furthermore the sealant is solvent free and halogen free and will not evolve halogen gases upon intumescence.

The sealant according to the invention preferably contains a minimum of 30% by weight of the heat-curing silicone resin, and 10 to 20% by weight of filler. The silicone resin used is commercially available as silicone gum. The silicone gum may have a molecular weight of about 250000 to 550000 and a penetration test value of about 600 to 900. Other silicone resins may be used in the compounding of the sealant. Although many fillers could be used, dolomite is preferred on the grounds of whiteness and economy.

The aluminium hydroxide preferably constitutes up to 40% by weight of the sealant. The amount of intumescence increases with the amount of aluminium hydroxide.

The sealant according to the invention may further contain any additives customarily included in such compositions. These may include surfactants, plasticisers, preservatives, pigments, toolability (shaping and forming) improvers and rheology modifiers. So called "high pressure" intumescent products, such as activated graphite and sodium silicate, may also be added.

It is especially preferred to add a luminous pigment suchas copper-activated zinc sulphide. This pigment luminesces in the absence of light, and may act as a visual identification of the grade of sealant to building inspectors and fire prevention officers, both on initial and subsequent inspections.

The invention is illustrated by the following Examples:

Example 1

A fire retardant intumescent non-setting sealant was prepared by compounding the following substances in a Narben mixer:

	% by weight
alpha, omega - divinylpolydimethylsiloxane, or alpha, omega - dimethylpolydimethylsiloxane	30.175
Aluminium hydroxide	31.228
Stearate coated calcium carbonate	8.772
Dolomite	17.544
Zinc borate	12.281
	100.000

In this composition, the stearate coated carbonate is a smoke suppressant and rheology modifier to prevent slump of the product. The zinc borate is fire retarding enhancing the fire retardant properties of the compound.

The composition is a non-setting, hand malleable paste capable of extrusion into rope form or custom profiled forms. It had a Smoke Index of 23 as determined according to Naval Engineering Standard 711, Isse 2 and a Toxicity Index of 0.19 as determined by Naval Engineering Standard 713, Issue 3.

The following results have been obtained by testing according to the stated British Standards:

BS 476: Part 6 (1989)	Class 'O'
BS 476: Part 7 (1987)	Class '2'
BS 476: Part 20 (1987)	4 hours

BS 6853 (1987) Appendix A - Clause A.9	< 350°C
BS 6853 (1987) Appendix B - Clause B.5.1	Ao 0.029
BS 6853 (1987) Appendix B - Clause B.5.2	Ao(ON)3.20; Ao(OFF)3.55

Example 2

A fire retardant intumescent luminous non-setting sealant was prepared as described in Example 1, but to the following composition:

	% by weight
alpha, omega - divinylpolydimethylsiloxane, or alpha, omega - dimethylpolydimethylsiloxane	30.175
Aluminium hydroxide	31.228
Stearate coated calcium carbonate	8.772
Dolomite	15.544
Zinc borate	12.281
Copper activated zinc sulphide	2.000
	100.000

The copper activated zinc sulphide pigment provides luminosity to the composition. The inclusion of the copper activated zinc sulphide does not affect the properties or performance as detailed in Example 1.

CLAIMS

1. A sealant comprising a silicone resin, a filler, a ceramic fire retardant, a smoke suppressant, and an intumescent compound which is either aluminium hydroxide or magnesium hydroxide.

2. A sealant according to claim 1 in which the intumescent compound is aluminium hydroxide.

3. A sealant according to claim 2 containing up to 40% of aluminium hydroxide.

4. A sealant according to any preceding claim in which the ceramic fire retardant is zinc borate.

5. A sealant according to any preceding claim containing at least 30% by weight of the silicone resin.

6. A sealant according to any preceding claim containing from 10% to 20% by weight of the filler.

7. A sealant according to any preceding claim in which the smoke suppressant is stearate coated calcium carbonate.

8. A sealant according to any preceding claim further comprising one or more of a surfactant, a plasticiser, a preservative, a pigment, a toolability improver and a rheology modifier.

9. A sealant according to any preceding claim further comprising activated graphite or sodium silicate as a high pressure intumescent additive.

10. A sealant according to any preceding claim further comprising copper activated zinc sulphide as a luminous pigment.

INTERNATIONAL SEARCH REPORT

Intern. ial Application No
PCT/GB 93/02321

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 C09K3/10 C08K3/00 C08K3/22 C09K21/14 C08L83/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 C09K C08K C04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 404 326 (DOW CORNING CORPORATION) 27 December 1990 see the whole document ---	1,2,4,7, 8
Y	EP,A,0 446 157 (RHONE-POULENC CHIMIE) 11 September 1991 see the whole document ---	1,2,4,7, 8
Y	DATABASE WPI Week 8105, Derwent Publications Ltd., London, GB; AN 81-06953D & JP,A,55 152 723 (HITACHI CABLE) 29 November 1980 see abstract --- -/--	1,2,4,7, 8

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
21 February 1994	10. 03. 94

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 337 792 (DOW CORNING CORPORATION) 18 October 1989 see page 3, line 15 - line 21 see claims; example 3	1,7,8
A	DATABASE WPI Week 8321, Derwent Publications Ltd., London, GB; AN 83-50766K & JP,A,58 065 751 (SHINETSU CHEM IND) 19 April 1983 see abstract	1-3,5,9
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A	GB,A,2 193 216 (GENERAL ELECTRIC COMPANY) 3 February 1988 see page 1, line 20 - line 23; claim 1	1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. .onal Application No
PCT/GB 93/02321

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